SPINAL SURGERY, OR OPERATIVE PROCEDURES ON THE SPINAL COLUMN FOR LESION OF THE CORD.[1]

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FROM the time of Heister (1745), who first suggested operations upon the laminæ, to Louis, 1762, who first removed depressed fragments of a fractured laminæ, (caused by a gun shot wound), down to the time of Kahler of Vienna, (1882), covering a period of almost a century and a half, during which period some of the most distinguished surgeons the world has ever produced, lived and practiced; but little seems to have been accomplished in this department of surgery. We find records of a large number of operations performed principally for injury. Heina and others had operated for disease, but it was not until after 1882 that the field seemed to broaden, that new lines were drawn, and the question of when, where, how and why, became studied in earnest.

The profession owes much to such men as McEwen of Glasgow, Horsley, Lane, Bowlby and Treaves of London, Schede-Schmaus, Kraska and Hoffa of Germany, and many others in Europe. In our own country, valuable work, from which interesting conclusions can be formed, has been done by Morris, Abbe, Wyeth, McBurney, McCosh, Briddon, Gerster, Fowler, Powell, Lloyd, Keen and many others.

I think I can safely say, however, without fear of successful contradiction, that more has been accomplished in the study of spinal surgery during the past ten years than in all the years of its previous history. While the results to the patient, may not have been materially better than in the century past, much valuable information has been added to our store.

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The effort of Maydyl, in 1882, to unite the severed ends of the spinal cord, and in 1885 the same attempt by Morris; the attempt of Abbe to unite nerves above the point of injury, to those below and thus establish nerve connection between the paralyzed parts of the brain—first suggested by Dana—the division of nerve trunks within the canal for the relief of incurable brachial neuralgia, by the same operator; the opening of the meninges of the cord in spinal meningitis to relieve pressure, and the frequent operations now performed for Pott's disease, and other lesions of the cord, and its membranes, are amongst the present suggestions in spinal surgery. To the neurologist the surgeon looks for help, and I have no doubt that, with the aid of the accurate knowledge of the neurologist, a most brilliant future will be opened for the field of spinal surgery.

I have performed laminectomy in five cases, and with your kind indulgence I will report them briefly in the abstract.

CASE I.—Spinal meningitis with pressure symptoms.

Child a female, eight years old, was taken with spinal meningitis July 20, 1888, with no apparent cause for the disease. There had been other cases in the neighborhood, some proving fatal; I do not think it was epidemic cerebro-spinal meningitis. When I saw the case again on July 29, I found her in convulsions. The pupils did not, or but feebly, respond to light and were dilated. When the convulsive action ceased she was in a position of opisthotonos. She was partly conscious, and complained of pain only in the back. At times she complained that she could not see. In the afternoon she was seized with another convulsion, from which I thought she would never recover. After an hour, with the moderate use of chloroform, the convulsive action ceased. I suggested an operation, which was consented too. As she had from the first complained of intense pain in the lumbar and dorsal region, I determined to operate at the easiest point to open into the spinal canal. The fifth and sixth dorsal spines were selected. I made the following incision, which is the same as that made in all the following cases.

An incision extending from the third dorsal spine to the seventh, was made in the median line and carried down to the tips of the spines. The tissues were now separated with a periosteotome and scissors, from the spinous processes and laminæ on both sides of the spines. The third spine was cut away at its junction with the laminæ, with a pair of bone forceps and the rouguer. The laminæ were then cut through and the canal freely opened. The meninges were inflamed and bulged freely into the wound. I quickly opened them, when about two ounces of sero-purulent fluid escaped; with a douch of boracic acid solution I carefully injected and washed out the canal. The meninges were left open and the wound packed with iodoform gauze, a few turns of the plaster of Paris bandage completed the dressing. The wound was dressed every six hours, and at each dressing, the dressings were found saturated with the same sero-purulent spinal fluid.

Immediately after the operation all the symptoms ameliorated in severity. There were no more convulsions, and the brain symptoms almost entirely disappeared the day following. The case went on to a favorable recovery. The wound healed in four weeks. The child had partial paralysis of the left limb, from which she never recovered, due to the severity of the disease.

I believed at the time, and so recorded it, that the case was one of pressure from fluid producing the symptoms, or possibly aggravating the symptoms frequently seen in spinal meningitis with cerebral complications.

Case II.—Female, age four years, admitted to Babies' ward at the Post-Graduate Hospital, March 9, 1892, with Pott's disease, upper dorsal region, with great kyphosis. She had been in the Hospital for Ruptured and Crippled for a long time. She had almost total paraplegia, which had existed for two years. Had measles and scarlatina when one year old. Soon after this illness she developed

Pott's suddenly; unable to walk since. She was emaciated and small, but in other respects seemed in good health. She had on a brace used in that institution.

On March 11, under ether, I made an incision over the point of greatest kyphos, over the spine of the fifth or sixth vertebra, and operated as in the preceding case. The canal for a space of two inches was filled with a hard tubercular caseous mass. This was scraped out with a Valkman's spoon. Puss was now seen to come freely from the vertebræ into the canal. I cut away the bone and found a large cavity, beyond which it was so extensively diseased, that I did not deem it good practice to attempt to excise. A large drainage tube was inserted and the cavity washed out with bi-chloride solution, and finally injected with iodoform and glycerine, $\frac{1}{2}$ oz. to 4 ozs. The wound was partially closed by suturing, and dressed as in the preceding case. There was no shock following the operation, and on the day following the operation, she had almost perfectly regained the power of her lower extremities. She rapidly improved, and it was expected that in a short time she would be running around. She died suddenly of pneumonia on April 17, 37 days after the operation. I have the specimen here. This, I think was a case in which earlier operation might have been successful.

Dr. Collins made the microscopic examination of the cord, which he will report upon.

HOSPITAL NOTES.

CASE III.—Male, aged 24, single; admitted to Post Graduate Hospital, June 17, 1892.

Diagnosis.—Paraplegia from fractured vertebræ. Family history good. Was brought in on a stretcher; had been in bed since his injury, nineteen months before. Previous history good until on September 1, 1890, he was knocked down by a runaway horse and paralyzed below the waist. Anæsthesia of legs and feet. Pain in the bladder and retention of urine. Later incontinence. For one week after the injury had complete retention of fæces. Six months following had incontinence of fæces. This gradually improved until now he can hold fæces long enough to get upon a bed pan. If he tries to urinate however, his bowels will move also. Following injury there was complete loss of motion in both limbs, anæsthesia in right leg up to the pelvis, and in the left leg to the line of the perineum; head of penis and scrotum also anæsthetic. Had sharp pains in the legs, which seemed to start in the feet or ankles and running up, occasionally stopping at the knee, but usually going higher, frequently to the testicles. Present condition: can feebly flex right leg on the thigh, no control below the ankle. Can flex left thigh very little, no control below knee. Sensation to touch in right thigh as low as knee; in left leg to half an inch below great trochanter. Still has pains in leg.

Operation under ether. Incision over seat of fracture. Laminæ and spines of two vertebræ excised. I found there had been a partial dislocation and fracture; the canal was tortuous, and a growth of new bone was found over the cord, this was removed and the vertebra cut away so as to straighten the canal. Pulsation appeared now as strong below the fracture as above. Drainage inserted, and dressed with plaster of Paris corset jacket. Wound healed without suppuration. Tenotomy of Tendo-Achilles of both feet was performed for contraction; he is able to walk quite well with the aid of crutches.

Discharged September 28, 1892, very much improved and still continues to improve. Dr. Franklin, of Greenwich, Conn., informs me by letter that the case is improving daily.

CASE IV.—City Hospital, Blackwell's Island.

Pott's disease; Italian; male, age about 30 years; family history gives nothing; patient denied any history of tuberculosis or traumatism. At time of admission to surgical ward of the hospital, one year before, there was a marked anteflexion of the spine, the column bending forward at about the last dorsal vertebra making a marked kyphos. He complained of pain at the affected part of spine, but could walk with crutches, and still preserved some sense of feeling in both lower extremities. In ward five he stayed two months, gradually losing power in his lower extremities, until they were completely powerless, with complete anæsthesia and loss of reflexes. Both legs were œdematous, the left more so.

Laminectomy was performed on the last two dorsal, and first lumbar vertebræ.

An abscess and mass of cheesy material pressing on the cord was found within the vertebral canal, between the membranes of the cord and the periosteum, which communicated with extensive disease of the vertebra. The membranes of the cord themselves were much adherent to the bony parts, but showed no signs of fresh inflammatory action. The meninges of the cord being laid open, no change could be detected in it. A large drainage tube was inserted into the bone abscess, after first washing it out. The membranes of the cord were now sutured with catgut and the wound closed with the same. Iodoform and bi-chloride dressings applied, and a plaster jacket put over all.

Patient did well, and on tenth day jacket was removed and wound inspected and found aseptic. Dressing and plaster jacket replaced, with fenestrum for inspection of wound. Some feeling returned to the extremities; tickling the sole would cause toes to jerk some, and patient could move foot slightly. He still complained of pain at the seat of operation, and gradually sank, dying from exhaustion on November 27, 1892, one month after the operation.

Dr. Fisher tried to examine the cord microscopically, but owing to rapid post mortem changes found it impossible.

The bodies of two vertebræ and inter-vertebral cartilages were destroyed, and a piece of bone protruded into the canal and was adherent to the meninges. This fragment of bone had completely severed the cord. An earlier operation might have saved the cord by removing the bone.

CASE V.—Harry Magill, age 18, single; admitted to Post Graduate Hospital, December 22, 1892.

Diagnosis.—Fracture cervical vertebra. Family history good, Previous history: healthy up to present illness. August 28, 1888. Patient was accustomed to diving from a barge, which on the above date moved from its former position to shallow water, depth of water being about three and a half feet. Patient dived, striking head forcibly against sand. Immediately paralysis of body ensued. Was brought to shore in a boat, unconscious, unable to walk. At first had anæsthesia, later hyperæsthesia of body. Paralysis below lesion in cervical vertebræ, difficulty in breathing; moved neck slightly.

Strychnine, atropia, massage, electricity, and plaster corsets applied with no benefit.

Present condition.—Slight motion of arms; unable to extend fingers, which remain flexed. Biceps and triceps strong. Arms atrophied. Fair use of neck and chest muscles. Knee reflex exaggerated—legs atrophied, markedly. Anæsthesia of legs—unable to distinguish heat from cold, when applied to legs—more sensitive in arms and hands, balances with crutches, dragging feet along. Knee bent far back.

Immediately following injury, had incontinence of fæces, and retention of urine requiring catheterization. At time of admission bowels slightly under control. Urine voided by pressure over pubes with catheter.

Operation.—December 24, 1892, under ether. Incision over cervical vertebræ, spines and laminæ of third, fourth and fifth cervical vertebræ excised; membranes of cord were thickened and adherent, resembling the fibrous mass of an old spinal hæmorrhage, which had made pressure on the cord. This was dissected off, and the wound closed with drainage tubes down to the cord. Drainage tube removed the following day, and wound packed with gauze; allowed to granulate. Wound healed without suppuration. Faradic electricity applied by Dr. Hammond during last month in hospital with success. Dr. Hammond will make a more elaborate report upon the case as he examined him before operation. Discharged very much improved February 14, 1893. Could extend and flex limbs, empty bladder and retain and expel fæces at will, and all his muscles were stronger. I will keep the patient under control and report upon him one year hence.

COLLECTED FROM THE WORKS OF NUMEROUS OPERATORS.

From the statistics which I have consulted, I find the mortality from operations for Pott's disease to be about forty per cent.

Schede operated on 8 cases, average age 10½ years, and 7 died.

Horsely on 7, average age 25½, 1 died.

Lain on 11, average age 12 years, 1 died.

McEwen, 5 cases and 2 deaths.

In Schede's eighth case there was no improvement.

Horsley had 2 recoveries, 3 improved, 1 no improvement, and 1 death in 7 cases.

Lain 6 cases cured, 2 improved, 2 unimproved after second operation, in 11 cases.

Both of my cases from Pott's died; 1 fracture recovered and could walk; 1 old hæmorrhage much improved; 1 spinal meningitis cured.

I have compiled all the cases published since Lloyd's paper, about 40 in number, and find the percentage varies but little from published reports.

In fractures and dislocations the mortality must be of necessity very great. A very large per cent. die whether operated upon or not. A fracture produced by bending the spine forward crushes the body of the vertebræ and the cord at the same time. In such cases an operation could be of doubtful efficacy, still after shock has passed and a certain time has elapsed, an operation should be attempted. It is often found impossible to restore the dislocated and fractured vertebra. In gunshot wounds of the spine an immediate operation should be performed. The same is true of tumors impinging upon the cord. I would operate upon spinal or cerebral spinal meningitis (non-epidemic), as soon as dangerous symptoms of compression, which did not improve by treatment, appeared. The same rule should be followed in hæmorrhages into or around the cord. My fifth case proved that much might have been hoped for from an immediate or early operation. Invasion of the canal from burrowing of pus along great nerve trunks, producing purulent meningitis, and also abscess from diseased vertebra producing same condition, should be operated on as soon as diagnosed. Some forms of meningitis, localized, and certain forms of tubercular meningitis, I believe, should be drained.

Dr. Abbe writes me that he has recently operated successfully on a case of syringo myelia.

The most serious subject for surgical study is parlysis following Pott's disease. We know that nearly all cases of Pott's paralysis recover through proper treatment. Myer places it at 55 per cent.; Gibney, 50 per cent.; Taylor and Lovett at about 90 per cent. So far as my own observations go, I would say that at least 90 or 95 per cent. under proper treatment recover; in fact I seldom see a case that does not, in the many scores that we treat annually at the Post Graduate and the University. We have, then, of this class of paralyzed patients, only ten or less, in every hundred, incurable without operation. Then arises the question: what per cent. of these ten are suitable for operation with a reasonable hope of improvement?

General statistics show a mortality of 40 per cent. In 36 cases by Schede, Horsley, Lane and McEwen there were eleven cures or about 30 per cent.; 11 deaths directly traceable to the operation, or 30 per cent.; leaving 40 per cent. uncured, or slightly improved, or died after many months. This is encouraging when we understand that all were hopeless cases.

When shall we operate? How shall we determine the cases which can be benefitted by operation?

The neurologist can be of great service to the surgeon in diagnosis.

Paralysis is produced, I believe, from pressure, first, by bending of the spinal column from destruction of bone (photograph of such a case shown).

Second: invasion of the canal by the tubercular process producing a large deposit of caseous matter and a meningitis, from invasion with deposit of inflammatory material. Sudden paralysis in Pott's is usually produced by bone pressure. (Photograph and specimens presented.) Whereas, slow progressive paralysis is produced by tubercular abscesses invading the cord, or a pachy-meningitis, and growth of granulations with inflammatory deposit. The cases of sudden paralysis are more likely to give away under mechanical treatment; whereas, the cases of long continued progressive paralysis are most likely to be intractable. I think a safe rule to follow in any case would be: treat the case mechanically for a time,—say two months—and if the paralysis continued to increase, or if it had become total, operate.

Cases with total paralysis, with incontinence either of urine or fæces of several months, or even weeks, duration, should be operated on if they do not immediately improve under treatment. Cases with well defined abscesses burrowing through the canal, with gradually increasing paralysis, should be operated on, the abscess scraped out, and good drainage established, and the spinal column examined. Operate in cases of pressure threatening the destruction of the cord.

OPERATION.

I prefer the median incision, cutting off the tips of each vertebra leaving them attached to the muscles, and removing the spines. It gives the operator more room, and the spine seems to be as strong after healing as before. The spinous processes prevent the fracturing of the spine by anterior flexion. When the wound has healed, the spines above and below are bound firmly together by the ligament, and spinous tips, and cicatrical tissue. A rougeur and bone cutter are the best instruments to use.

In septic conditions the wound should be treated open.

A plaster corset should be applied over the dressing at each time. Electricity seemed to improve the power of the muscles in three of my cases.

IN CONCLUSION.

The outlook for the success of spinal surgery is not so gloomy as it has been painted.

Only incurable cases by other methods should be operated on; then if one in fifty can be saved it means much.

Operations in recent fractures, and dislocations, and gunshot wounds show a larger mortality, because of the large number that would die even if an operation was not done. This should not deter the surgeon from operating. Cases that would certainly die, or recover hopelessly paralyzed, may be saved or cured by operation.

Finally, it would be an advantage if the study of spinal surgery could be conducted jointly by the surgeon and the neurologist.